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(54) Torque measuring coupling device

(57) Driving shaft 1 and driven shaft 2 are connected to discs 3 and 4 respectively, there being tension springs 11 and 12 connected between the discs 3 and 4 so that torque is transferred via the springs 11 and 12 resulting in measurable angular displacement between the shafts 1 and 2. The discs 3 and 4 are formed with alternately arranged circular holes 6 and arcuate slots 7, so that the circular holes 6 in one plate overlie the arcuate slots 7 in the other, and each circular hole 6 bears a post 9 which protrudes through the arcuate slot 7 with which its circular hole 6 is aligned. A further disc 8 is provided with holes 6 and slots 7. The springs 11 and 12 are coupled between the protruding ends of adjacent posts 9. The angular displacement between the two shafts may be measured by means of a scale 13 and a pointer (not shown), or by stroboscopic means, or a ratchet.

Fig.1.

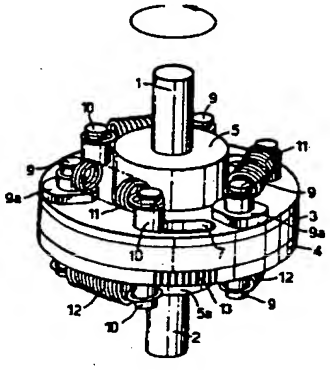
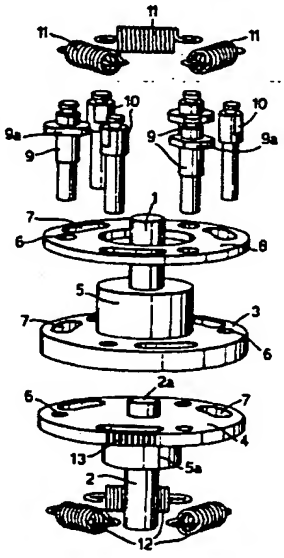


Fig.2.



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig.1.

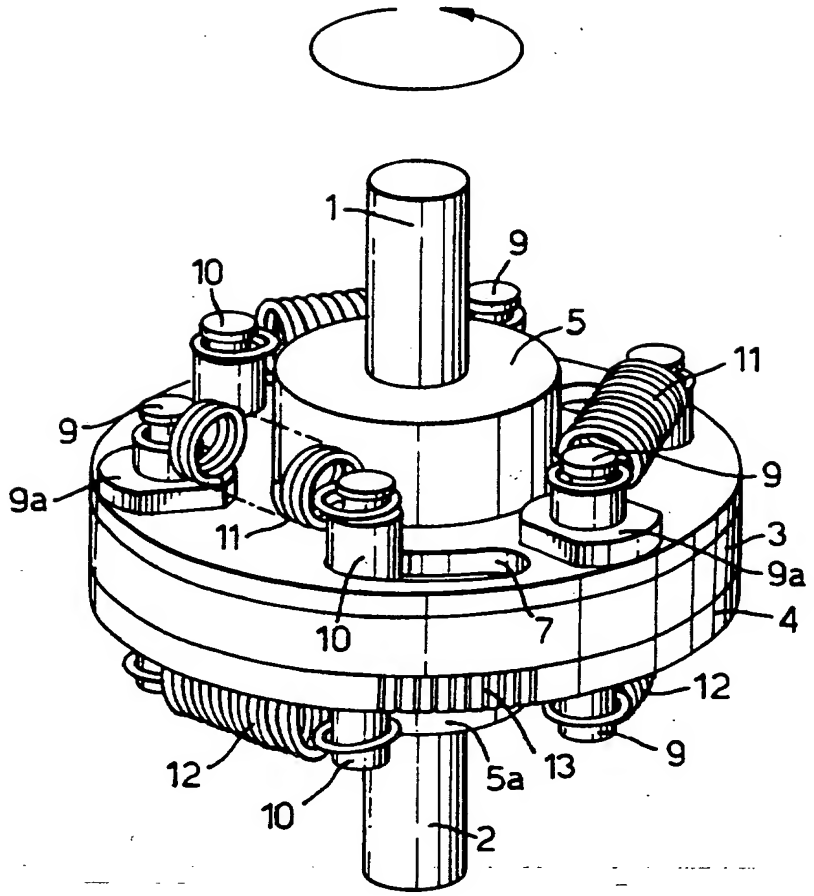
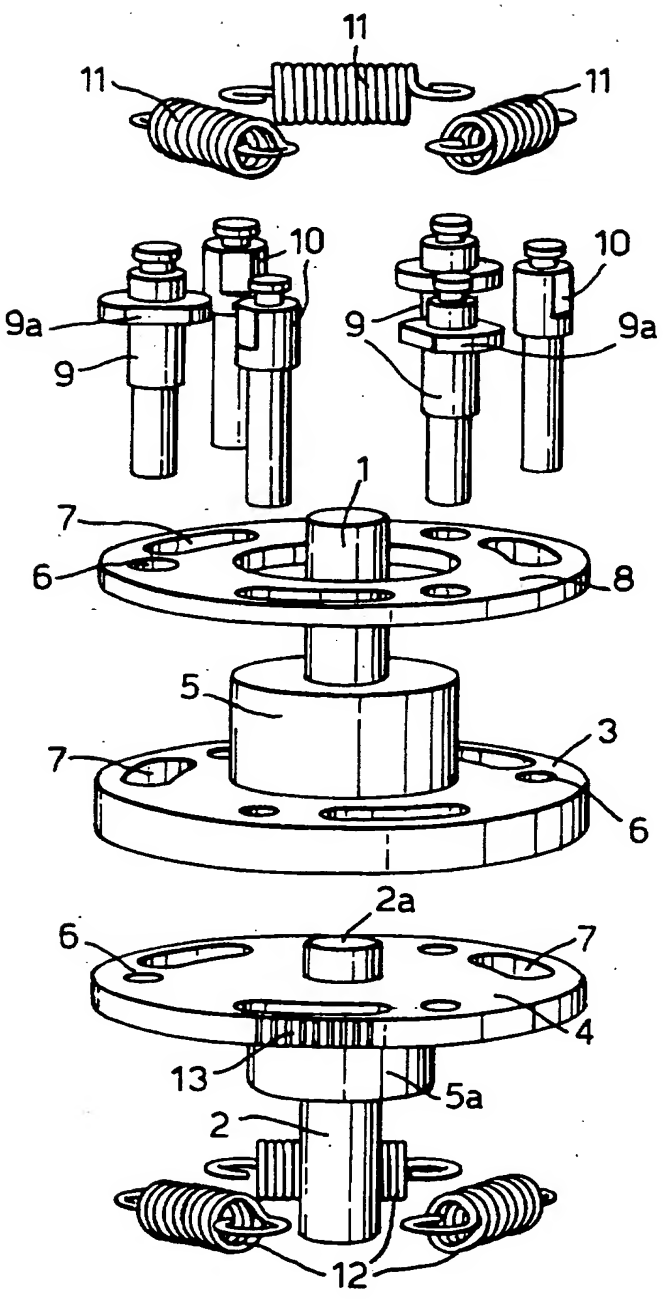


Fig.2.



TORQUE MEASURING COUPLING DEVICE

The present invention relates to a coupling device for measuring the torque loading on a driven shaft, for example the output shaft of a machine.

Such devices are known and may incorporate a torque transducer and associated electronic circuitry but these devices are generally bulky and expensive. Other known torque transmitting coupling devices employ axially extending springs which occupy a considerable axial space between the driving shaft and driven shaft. Such arrangements may not be suitable or convenient in some torque measuring applications.

It is accordingly an object of the present invention to provide a torque transmitting and measuring coupling device which is compact and in particular occupies a relatively small space in the axial direction.

According to the present invention a torque transmitting and measuring coupling device comprises a driver coupling member for connection to a driving shaft and a driven coupling member for connection to a driven shaft, a spring arrangement disposed about the driver coupling member and capable of exerting a force in a direction generally normal to the axis of rotation of said shafts, said spring arrangement including at least one first end secured with respect to said driver coupling member and at least one second end secured with respect to said driven coupling member, the arrangement being such that torque is transferred to the driven shaft via said spring arrangement as the driving shaft rotates and that an angular displacement which can be measured occurs between the driver coupling member and the driven coupling member depending on the torque loading on the driven shaft.

Advantageously each coupling member comprises a circular or disc-like apertured plate having a central boss by means of which it is secured to its associated shaft. In order to maintain the shaft concentric, the end of one shaft may be arranged to locate in the coupling member of the other shaft. A further circular plate may be disposed adjacent one of the coupling members and is rotatable about its central boss. Each of the three plates is provided with apertures in the form of an alternating series of holes and arcuate slots.

The spring arrangement advantageously comprises a set of springs and in a preferred form of the invention a first set of springs is disposed about the driver coupling member and a second set of springs is disposed about the driven coupling member.

The two sets of springs are advantageously anchored at each of their ends to an anchoring post; there being two sets of anchoring posts, one set being fastened to each of the driver and driven plates and the ends of each spring being anchored to one post of each set. The anchoring posts of one set may be provided with a flange which bears against the rotatable plate or one of the coupling members and these posts also serve to maintain the plates of the coupling together and prevent axial movement.

Preferably the periphery of one of the driver or driven plates is provided with a scale which co-operates with a pointer or strobe in order to measure the angular displacement and hence the torque transmitted from the driving shaft to the driven shaft.

The invention will now be further described by way of example, with reference to the accompanying drawings, in which:

Figure 1 is perspective view of one embodiment of a torque transmitting and measuring coupling device according to the invention; and

Figure 2 is an exploded perspective view of the coupling device shown in Figure 1.

Referring to the drawings, the coupling device illustrated is intended for transmitting and measuring torque between a driving shaft 1 and a driven shaft 2 subjected to a load. The coupling device consists of a driver coupling member 3 secured to the driving shaft 1 and a driven coupling member 4 secured to the driven shaft 2. The coupling members 3 and 4 each comprise a circular apertured plate and include a central boss 5, 5a, secured to their respective shafts e.g. by means of grub screws or tension pins (not shown). As seen in Figure 2 the end 2a of the driven shaft 2 extends beyond the coupling member 4 to locate in the adjacent end of the driver coupling member 3 and thereby maintain the coupling members concentric. Each apertured plate 3, 4, is provided with three threaded holes 6 alternating with three arcuate slots 7. A further rotatable circular plate 8 is arranged about the boss 5 above the plate 3 (in the attitude shown in the drawings) and is also provided with similar holes 6 and arcuate slots 7, except that the holes are not threaded. Two sets of three anchoring posts 9 and 10 are

provided for anchoring the ends of two sets of three tension springs 11 and 12, which are respectively disposed about the driver and driven coupling members and are capable of exerting a force in a direction generally normal to the axis of rotation of the shafts 1 and 2.

The anchoring posts 9 are provided with a flange 9a which bears against the surface of the plate 8 and holds it captive against the plate 3. The anchoring posts 10 pass through the arcuate slots in the plate 8 and are threaded into the holes 6 in the plate 3. The bases of these posts protrude through the arcuate slots in the plate 4. The anchoring posts 9 pass through the plain holes in plate 8 and the arcuate slots in the plate 3, and are threaded into the holes in the plate 4. The sets of tension springs 11 and 12 are anchored between the pairs of posts 9 and 10 adjacent the discs 8 and 4.

Axial movement between the components of the coupling is prevented because the driver coupling member 3 is sandwiched between the plate 8 and the driven coupling member 4. The flanges 9a of the posts also serve to keep the coupling assembly together, though the dimensioning of the posts 9, 10 and the screw threaded regions thereon are chosen to ensure that the whole assembly is not so tightly bound together as to preclude the desired rotation of plates 8 and 4 relative to plate 3.

It will be appreciated that as the driving shaft 1 rotates, torque is transferred to the driven shaft 2 via the springs 11 and 12. There will thus be an angular displacement between the two shafts due to the springs extending to a sufficient extent to equalise the driving torque.

A scale 13 is provided on the periphery of the plate 4 which co-operates with a pointer (not shown) to measure the torque. Alternatively the scale can be read by stroboscopic means. In another variation a ratcheting motion can be arranged between the plate 3 and 4 which could then give a reading of maximum torque.

In one particular construction of the embodiment described the coupling device has an overall axial length of 28mm, an overall diameter of 45mm and is capable of measuring a torque up to a value of 2Nm.

As will be understood, the number and rate of the springs may be varied to accommodate a range of torques and in some applications only one spring may be required. If desired the device can be statically calibrated by using a torque wrench.

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According to a modification, the second set of springs 12 may be omitted. The plate 8 may also be omitted in which case the flanges 9a of the posts 9 bear directly on the surface of the driver plate 3.

Claims

1. A torque transmitting and measuring coupling device comprising a driver coupling member for connection to a driving shaft and a driven coupling member for connection to a driven shaft, a spring arrangement disposed about the driver coupling member and capable of exerting a force in a direction generally normal to the axis of rotation of said shafts, said spring arrangement including at least one first end secured with respect to said driver coupling member and at least one second end secured with respect to said driven coupling member, the arrangement being such that torque is transferred to the driven shaft via said spring arrangement as the driving shaft rotates and that an angular displacement which can be measured occurs between the driver coupling member and the driven coupling member depending on the torque loading on the driven shaft.

2. A device according to claim 1 wherein each coupling member comprises a circular or disc-like apertured plate having a central boss by means of which it is secured to its associated shaft

3. A device according to either of claim 1 or 2 wherein the end of one shaft locates in the coupling member of the other shaft in order to maintain concentricity of the components.

4. A device according to any preceding claim wherein a further circular plate is disposed adjacent one of the coupling members and is rotatable about its central boss.

5. A device according to claim 4 wherein each of the three plates is provided with apertures in the form of an alternating series of holes and arcuate slots.

6. A device according to any preceding claim wherein the spring arrangement comprises a set of springs and wherein a first set of springs is disposed about the driver coupling member and a second set of springs is disposed about the driven coupling member.

7. A device according to claim 6 wherein the springs of each set are anchored at each of their ends to respective anchoring posts, said posts being arranged in two sets with one of said sets of posts being fastened to each of said driver and driven plates, and wherein the ends of each spring are anchored to one post of each set.

8. A device according to any preceding claim wherein the periphery of one of said driver or driven plates is provided with a scale adapted to co-operate with a pointer or scale other means to indicate the angular displacement between said plates, and hence the torque transmitted from the drive shaft to the driven shaft.

The Patent Office

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Application No: GB 9702552.2
Claims searched: 1 - 8

Examiner: Peter Weller
Date of search: 13 March 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G1W F2U

Int Cl (Ed.6): G01L 3/14

Other: ONLINE: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 1146836	LUCAS - BOTH FIGS	1 at least
X	GB 889469	R.E.T.E.M. - FIG 8	"
X	GB 640238	MORTSELL - FIGS 5,6	"

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.